BELCATEC DESIGN
799 6ieme Avenue Pointe-Aux-Trembles, QC, H1B 4K6
Tel:(514) 645-6353 Fax:(514) 645-6353
ÉLECTRONIQUE & CONTRÔLE
INFORMATIQUE & SYSTÊME

USER MANUAL

OF

MASTER CONTROLLER

PRODUCT DESCRIPTION:

Unit MASTER CONTROLLER is part of family developed by BELCATEC DESIGN named ACCUSYSTEM.

MASTER CONTROLLER allows programming and monitoring following modules: ACCUBUBBLE, OUTPUT BOARD, MIMIC BOARD (Series used for ACCUBUBBLE MONITORING SYSTEM for anaerobic digester application).

ACCULEVEL, ACCUPRESS (Series used for levels monitoring and pressure monitoring) measuring devices for controlling of liquid level of WIER and PARSHALL channel also PRESSURE monitoring for compressor or other safety devices.

This manual is written in sections which describe de control and/or operations/monitoring of connected modules.

PHOTO OF MASTER CONTROLLER UNIT

BELCATEC DESIGN

Description	Page
Section 1: MASTER CONTROLLER description	4
Section 2: MASTER CONTROLLER operation's	5
Section 3: Choice of work on module	6
Section 4: ACCULEVEL modification's	15
Section 5: Setting variables for a PARSHALL channel	33
Section 6: Monitoring of ACCULEVEL	40
Section 7: Viewing the totals of FLUME clicks and Flows	43
Section 8: Modification/Monitoring of ACCUBUBBLE PROBE	46
Section 9: Modification/control of OUTPUT BOARD	55
Section 10: Modification of MIMIC BOARD	69
Section 11: Modification/Monitoring of ACCUPRESSURE	76

Section 1
MASTER CONTROLLER description

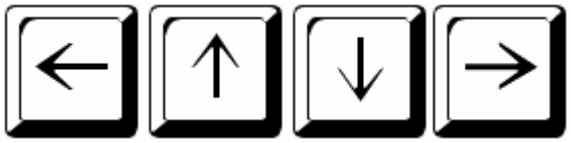
MASTER CONTROLLER is Build with following elements:

- Micro controller running at 3MIPS
- Real Time Clock
- Fluorescent display: 4 lines of 20 character's
- 4 keys keyboard

MASTER CONTROLLER is connected to all present modules using serial link RS-485. Each type of modules has proprietary protocol and is connectable using that link.

Possibility to access certain module only if programmed during fabrication using requested list by client.

All operations are executed using only 4 buttons keyboard.



In general operations, keys are used as follow:

Return to main screen. Similar as

key on PC keyboard

Or move cursor one position to left when adjusting value.

Next choice

Or decrement value at cursor position

Preceding choice
Or increment value at cursor position

Selecting choice similar as <ENTER> on PC keyboard
Or move cursor one position to right.
If already at most right position, validate value.

Section 2: MASTER CONTROLLER operation's

When power up or awake by touching a key:
This screen is shown:

```
BELCATEC DESIGN INC.
Master Controller
Version 1.00 / 1.00
MM/DD/YY WD HH:MM:SS
```

Clock value may be absent (if it is a wake up)

Screen will stay on for programmed time then blanks waiting for wake up.
Clock stays on for 5 minutes.

ACCUMASTER can be set to operate in two languages FRENCH or ENGLISH.

Pressing key may show one following screens:

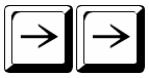
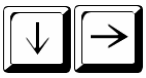
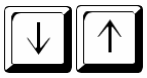
French

```
BELCATEC DESIGN INC.
Master Controller
Version 1.00 / 1.00
JJ/MM/AA JS HH:MM:SS
```

English

```
BELCATEC DESIGN INC.
Master Controller
Version 1.00 / 1.00
MM/DD/YY WD HH:MM:SS
```

How to set English screen:

Press  followed by  then using  to select language.
Terminate by pressing

ACCUMASTER will reset and shows selected language. Date is shown in selected language.

Further information's:

When <?> is shown at most right position on third line: It is a choice.
Pressing key will select it.

Section 3: Choice of work on module

Depending of setup code settle in ACCUMASTER following modules may be accessed, monitor and adjusted.

Accessible modules are determined by operation code value of ACCUMASTER in following way:

ACCUPRESSURE	bit 4 (16)
ACCULEVEL	bit 3 (8)
MIMIC display	bit 2 (4)
OUTPUT board	bit 1 (2)
ACCUBUBBLE	bit 0 (1)

Example: value (31) means all available ACCUSYSTEM modules can be accessed.
Example: value (7) ACCUBUBBLE, OUTPUT, MIMIC only
Depending on model of ACCUMASTER some sections may not be available.

One of possibilities is to press it will change screen to following:

```
    Select Module
      To Work on
  Master Controller ?
MM/DD/YY WD HH:MM:SS
```

Pressing key will select (Master Controller) to work on allowing adjusting parameters of MASTER CONTROLLER (itself).

Or pressing key will change screen to following:

```
    Select Module
      To Work on
       ACCULEVEL      ?
MM/DD/YY WD HH:MM:SS
```

When <?> is locate at right most of third line, it is a possible choice

Pressing key will select ACCULEVEL Probe to work on allowing adjusting parameters in level measuring module.

Or pressing key will change screen to following:

```
    Select Module
     To Work on
    OUTPUT Board    ?
MM/DD/YY WD HH:MM:SS
```

Pressing key will select OUTPUT Board to work on allowing adjusting parameters in OUTPUT BOARD.

Or pressing key will change screen to following:

```
    Select Module
     To Work on
     ACCUBUBBLE     ?
MM/DD/YY WD HH:MM:SS
```

Pressing key will select ACCUBUBBLE to work on allowing adjusting parameters in ACCUBUBBLE PROBE.

Or pressing key will change screen to following:

```
    Select Module
     To Work on
DISPLAY Board MIMIC?
MM/DD/YY WD HH:MM:SS
```

Pressing key will select DISPLAY Board MIMIC to work on allowing adjusting parameters in MIMIC DISPLAY BOARD.

Or pressing key will change screen to following:

```
    Select Module
     To Work on
    ACCUPRESSURE    ?
MM/DD/YY WD HH:MM:SS
```

Pressing key will select ACCUPRESSURE to work on allowing adjusting parameters in ACCUPRESSURE PROBE.

NOTE: Depending on value entered in MODE variable of MASTER CONTROLLER. Some screen may not be available. Preceding screens may not be available. Also some ACCUMASTER may not be originally programs with all modes. Refer to identification on Micro Controller I.D. sticker.
PR= ACCUPRESSURE, LE= ACCULEVEL, MI= DISPLAY Board, OU= OUTPUT Board, AC=ACCUBUBBLE

When following screen is shown and key pressed

```
    Select Module
      To Work on
  Master Controller ?
MM/DD/YY WD HH:MM:SS
```

This screen allows accessing variables in MASTER CONTROLLER.

MASTER CONTROLLER has three adjustable functions

1- **The Clock**
2- **The language**
3- **The Operation code**

First choice is <**Adjust Clock**>

```
MASTER Cont. SET-UP
Module # 1
Adjust CLOCK        ?
MM/DD/YY WD HH:MM:SS
```

Second choice is <**Language**>

```
MASTER Cont. SET-UP
Module # 1
Language            ?
MM/DD/YY WD HH:MM:SS
```

Third choice id <**Operation Code**>

Using following you can select code

```
MASTER Cont. SET-UP
Module # 1
Op. CODE              ?
MM/DD/YY WD HH:MM:SS
```

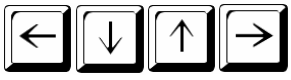
If screen is following pressing will allows setting Clock values

```
MASTER Cont. SET-UP
Module # 1
Adjust CLOCK          ?
MM/DD/YY WD HH:MM:SS
```

Setting Years

```
MASTER Cont. SET-UP
Adjust CLOCK
Year                 ??
MM/DD/YY WD HH:MM:SS
```

<??> at right is replaced by actual value of Year.
A big block indicates position of number to change.

Using  it is possible to modify shown value.

More details:

Pressing will move cursor to left

Pressing will decrease value at cursor position by 1

Pressing will increase value at cursor position by 1

Pressing will move cursor to right

NOTE: If cursor is located at most right position; pressing will complete modification and clock adjustment will show next element.

Setting Months

```
MASTER Cont. SET-UP
Adjust CLOCK
Month                ??
MM/DD/YY WD HH:MM:SS
```

Setting sequence is following:
Years, Month, Days,
Days of week (1=Sunday 7=Saturday),
Hours, Minutes, Seconds.

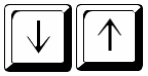
Note: It is not possible to get out of clock adjustment mode, you have to go trough, but if you left unit for a while it will return to sleeping mode. Day of week is shown in middle with two character's SU MO TU WE TH FR SA

Second choice is <Language>

```
MASTER Cont. SET-UP
Module # 1
Language              ?
MM/DD/YY WD HH:MM:SS
```

If screen is following pressing will allows setting values of language

```
MASTER Cont. SET-UP
Module # 1
1=English 0=French ?
MM/DD/YY WD HH:MM:SS
```

<?> is replaced by actual choice 0 or 1 using you  can change used language.

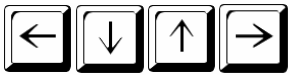
When button is pressed: MASTER CONTROLLER will restart with language selected. If your choice is FRENCH Please refer to French manual.

Third choice is <Operation CODE>

```
MASTER Cont. SET-UP
Module # 1
Op. CODE              ?
MM/DD/YY WD HH:MM:SS
```

If screen is preceding pressing will allows setting values of operation code

```
MASTER Cont. SET-UP
OPCODE 16=PRS 8=LVL
4=DIS 2=OUT 1=BUB ??
MM/DD/YY WD HH:MM:SS
```

<??> at right is replaced by actual value of CODE.
A big block (cursor) indicates position of number to change.
Using  it is possible to modify CODE value.

Accessible modules are determined by operation code value of MASTER CONTROLLER in following ways:

ACCUPRESSURE	bit 4 (16)
ACCULEVEL	bit 3 (8)
MIMIC display	bit 2 (4)
OUTPUT board	bit 1 (2)
ACCUBUBBLE	bit 0 (1)

Example: value (31) means all available ACCUSYSTEM modules can be accessed.
Example: value (7) ACCUBUBBLE, OUTPUT, MIMIC only
Depending of model of ACCUMASTER some sections may not be available.

Section 4: ACCULEVEL modification's

If screen is following pressing will allows setting values in ACCULEVEL

```
    Select Module
     To Work on
      ACCULEVEL      ?
MM/DD/YY WD HH:MM:SS
```

Following screen is shown

```
   ACCULEVEL PROBE
Research L-PROBE ?
Specify #
MM/DD/YY WD HH:MM:SS
```

ACCULEVEL (Level Probe) may be found automatically by pressing key

Or number may be entered by pressing then set number.

Automatic research screen

```
   ACCULEVEL PROBE
Research PROBE....xx

MM/DD/YY WD HH:MM:SS
```

When using automatic research; found number will replace <xx>.

If an ACCULEVEL is found, following screen will be shown.

```
  ACCULEVEL PROBE
Research PROBE....xx
Find  xx L-Probe
MM/DD/YY WD HH:MM:SS
```

Value in <xx> is replaced by found ACCULEVEL module.

Pressing will continue searching with next number

Pressing will restart search with number 01

Pressing will select module as working on and next screen will be shown.

Pressing will return MASTER CONTROLLER to first screen.

If number reaches 16 and no module is found following screen will be shown.

```
  ACCULEVEL PROBE
Research PROBE....16
LProbe NOT connected
MM/DD/YY WD HH:MM:SS
```

With this screen shown, it is possible to restart automatic research by pressing.

Using specific research it is also possible to restart automatic research.

Specific research:

```
   ACCULEVEL PROBE
SPECIFY # L-PROBE
To Work on 01-16  ??
MM/DD/YY WD HH:MM:SS
```

Using four buttons enter number of target ACCULEVEL. Permitted values are 01-16.

When cursor is localized at most right position and key is pressed:
A test to reach module is activated.

If researched module is not in system following screen will be shown.

```
   ACCULEVEL PROBE
Research PROBE....16
LProbe NOT connected
MM/DD/YY WD HH:MM:SS
```

NOTE: if research is made with automatic or specific, when module is found pressing will show next screen.

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Modify ?????? Listen
MM/DD/YY WD HH:MM:SS
```

Module number replaces <xx>

Pressing or allows modifying parameters in ACCULEVEL

Pressing or allows listening or monitoring ACCULEVEL

List of modifiable parameters of ACCULEVEL

CHOICE	DESCRIPTION
- Nbr. : of LPROBE	Modify designation of L-Probe
- Operation Mode	Modify mode of operation
- Mod. : PUMP_ON time	Modify time ON duration of gas pump
- Mod. : PUMPOFF time	Modify time OFF duration of gas pump
- Mod. : Lev1 ON Set Point	Adjust where Level 1 turn ON
- Mod. : Lev1 OFF Set Point	Adjust where Level 1 turn OFF
- Mod. : Lev2 ON Set Point	Adjust where Level 2 turn ON
- Mod. : Lev2 OFF Set Point	Adjust where Level 2 turn OFF
- Fix K1 mode	Allow to assign output K1
- Fix K2 mode	Allow to assign output K2
- Fix OPTO mode	Allow to assign output OPTO
- Mod. : OFFSET value	Allows to set distance value from end of tube to bottom of channel/Vessel
- Mod. : INCHES/STEP	Allows to set step value in inches
- Mod. : MM/STEP	Allows to set step value in millimeters
- Mod. : 4-20 STEP	Allows to set multiplication of step to mA
- Mod.: Mod. CAL. Val.	Allows to set calibration value to get zero value
- Mod.: FLUME	Allows setting FLUME / WIER parameters

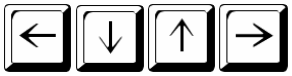
Following screens are more information's to adjust ACCULEVEL

Probe address set-up

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
NBR.: of L-PROBE   ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
Enter NBR. 01-16  ??
MM/DD/YY WD HH:MM:SS
```

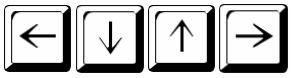
With keys  it is possible to adjust ACCULEVEL address on RS-485 network.

NOTE: about values modification in ACCUBUBBLE

To modify value you must enter the key code

If you can read following on third line:

```
ENTER KEY          0000
```

You must enter the code using  keys

To obtain code ask your foreman or call Belcatec Design Inc. (514) 645-6353 ask for René Bellefleur.

NOTE: about modification of ACCUBUBBLE address.

It is not possible to give same address to more than one module in an ACCUSYSTEM.

Modify address also change memory locations which are maintaining totals of flow in MASTER CONTROLLER. MC uses address of ACCULEVEL as base memory location.

OPERATION MODE

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Operation MODE     ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
Enter MODE OP. 0-2 ?
MM/DD/YY WD HH:MM:SS
```

Using keys it is possible to modify operation mode.

Only three modes are possible

Mode 0 = Level detector with gas pump always ON
Mode 1 = Level detector with control of gas pump
Mode 2 = Measuring of flow for FLUME/WEIR channel with control of gas pump.

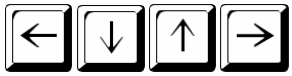
NOTE: In level detector mode measurement may be differential by connecting both tubes to both sensing elements.

Working time of gas pump (Time ON)

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
Mod. PUMPON Time   ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
PUMPON Time     ?????
MM/DD/YY WD HH:MM:SS
```

Using keys  it is possible to modify operation time of pump.

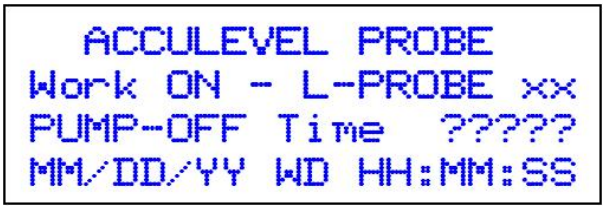
Minimum is 00001 = 1mS
Maximum is 65535 = 65.535 Sec

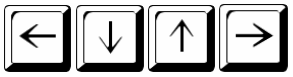
Note: When mode value is <0> modifying time will have no effect because pump is always activated. When mode is 1 or 2 no measuring are taken when pump is activated, so time shall be short, around 0.5 Sec. (0500)

Time gas pump OFF

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Mod. PUMP-OFF Time ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.



Using keys  it is possible to modify OFF pump time.

Minimum is 00001 = 1mS
Maximum is 65535 = 65.535 Sec

Note: When mode value is <0> modifying time will have no effect because pump is always activated. When mode is 1 or 2 measurement are taken when pump is OFF, so time shall be long, around 30 Sec. (3000)

NOTE about detection level:

ACCULEVEL is able to detect two different levels (LEV1, LEV2) each set point are arranged with turn ON and turn OFF.
If both points are programmed with same value output assigned to it may become unstable when level is around set points.
Having a gap is recommended.

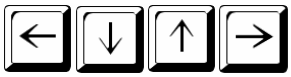
Operations may be ON-OFF or OFF-ON. Next figures show how to do those settings.

Set point LEV1 ON

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Mod. L1-ON Level   ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
L1-ON Level     ?????
MM/DD/YY WD HH:MM:SS
```

Using keys  it is possible to modify LEVEL 1 ON set point.

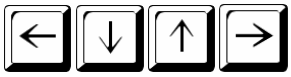
Set point LEV1 OFF

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Mod. L1-OFF  Level ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.

Set point LEV1 OFF

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
L1-OFF  Level  ?????
MM/DD/YY WD HH:MM:SS
```

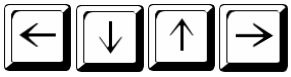
Using keys  it is possible to modify LEVEL 1 OFF set point.

Set point LEV2 ON

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
Mod. L2-ON  Level  ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
L2-ON   Level  ?????
MM/DD/YY WD HH:MM:SS
```

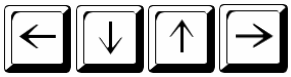
Using keys  it is possible to modify LEVEL 2 ON set point.

Set point LEV2 OFF

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Mod. L2-OFF  Level ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
L2-OFF  Level  ?????
MM/DD/YY WD HH:MM:SS
```

Using keys  it is possible to modify LEVEL 2 OFF set point.

NOTE: About operating ON-OFF OFF-ON levels:

If set point ON is lower than set point OFF, if level is lower than ON set point, output will goes ON. When level reaches OFF set point, output goes OFF and goes ON again when level is lower than ON set point. (May be used to fill up a reservoir)

In counter part:

If set point OFF is lower than set point ON, if level is lower than OFF set point, output is set OFF. When level reaches ON set point, output goes ON and goes OFF again when level is lower than OFF set point. (May be used to empty a reservoir)

Setting values ON-OFF with small variation allows using ACCULEVEL as level detector. (Two different levels are programmable)

Assignation output K1

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Set K1 Mode        ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Set K1 Mode  0-4   ?
MM/DD/YY WD HH:MM:SS
```

Using keys it is possible to modify assignation of output K1.

Five modes are available for three ACCULEVEL outputs

K1, K2 and OPTO

Mode	Description
0=	Control for gas pump
1=	Level 1
2=	Level 2
3=	FLUME pulse
4=	always ON

More then one output may be assigned to same controlled element
Depending of model some output may be absent.

Assignation output K2

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
Set K2 Mode        ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
Set K2 Mode  0-4   ?
MM/DD/YY WD HH:MM:SS
```

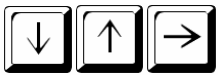
Using keys it is possible to modify assignation of output K2.

Assignation output OPTO

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
Set OPTO Mode      ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
Set OPTO Mode 0-4  ?
MM/DD/YY WD HH:MM:SS
```

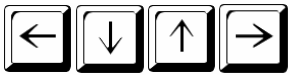
Using keys  it is possible to modify assignation of output OPTO

Modify OFFSET value

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
Mod. OFFSET VALUE  ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
OFFSET VALUE   ?????
MM/DD/YY WD HH:MM:SS
```

Using keys  it is possible to modify OFFSET

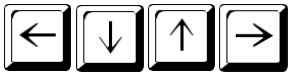
OFFSET VALUE is added to measured value to obtain real position. Tube immersed in liquid is normally not placed at bottom of measuring point, usually at ¼ inches or more. OFFSET value is used to compensate tube position.

Modify STEP value in INCHES

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Mod. INCHES/STEP   ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Inches/STEP     ?????
MM/DD/YY WD HH:MM:SS
```

Using keys  it is possible to modify STEP value in inches

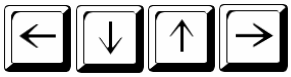
This value is multiplied with measured STEP's value to obtain reading in inches. (Typically 0.01250, Enter 01250)

Modify STEP value in MILLIMETERS

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Mod. MM/STEP       ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
Milimeter/STEP ?????
MM/DD/YY WD HH:MM:SS
```

Using keys  it is possible to modify STEP value in millimeters.

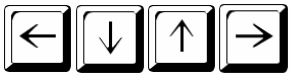
This value is multiplied with measure STEP's value to obtain reading in millimeters. (Typically 0.33510, only 33510 need to be entered)

Modify 4-20mA multiplier of step value or multiplier of flow value in FLUME mode.

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
Mod. 4-20ma/STEP   ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
4-20ma/STEP    ?????
MM/DD/YY WD HH:MM:SS
```

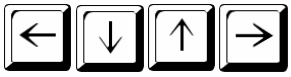
Using keys  it is possible to modify multiplier.
Value entered is with 3 decimal. Value possible: 00.001 up to 65.535

Modify calibration value

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Mod. Calibration   ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Calibration     ?????
MM/DD/YY WD HH:MM:SS
```

Using keys  it is possible to modify calibration value.

Calibration value is used to set reading to zero when level is zero
It may be different from probe to probe, to compensate tinny differences in electronic circuitry

Available only if ACCULEVEL is configured to read FLUME/WIER channel.

Section 5: **Setting variables for PARSHALL channel**

Modification of FLUME values

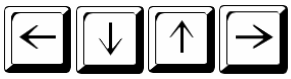
```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Modify FLUME Value ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Modify CLICK Value ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
CLICK Value ????????
MM/DD/YY WD HH:MM:SS
```

Using keys  it is possible to modify Click value.

This value determines Flume click and is used to generate click pulse to totalize quantity of liquid passed trough FLUME.

How to find good value which is in relation with others values of FLUME measurement.

Such as: Tables FLUME correction values
Value between points of curve.
Frequency of CLICK's

NOTE: Click value allows determining and recording flow passing trough channel. This value may be 10, 100, 1000 liters, gallons, cubic feet, cubic meter or others

Frequency when channel is at maximum capacity shall not exceed 2 pulses (CLICK) per second.

Click counters are memorized in non volatile memory located in MASTER CONTROLLER. All counters cannot be cleared by MASTER CONTROLLER which holds accumulator of 20 digits.

Eight accumulator values (1 per day with preceding week day) 16 digit accumulators are recording day's values which are cleared at beginning of actual day.

Day changes every time clock shows 00:00 hrs.

FLUME curve can be corrected using 30 steps which allow computation with very small error.

Values of flow are computed every 62.5 millisecond or 16 times per second. At each 62.5 millisecond height reading is measured. If value is corresponding to a multiple of heights set in table then value from table is add to accumulator. If accumulator reaches value of CLICK then CLICK is generated and click information is sent to MASTER CONTROLLER which will record value in

corresponding memory block. Accumulators are not reset keeping their values; which is working as a linear extrapolation.

Following shows 100 gallons (UK) click using flume of 9” inches wide. Value of table are entered with one decimal
Parameters: Between point height 24"/30 = 0.8”
Gallon per minute US /0.7505703 = Gpm UK

Height inches	Decimal foot	Gp/M US	Gp/M UK
0.8	0.0666	19.1	13.8
1.6	0.1333	64.0	41.1
2.4	0.2	117.0	84.3
3.2	0.2666	180.0	129.7
4.0	0.3333	254.0	183.0
4.8	0.4	339.5	244.6
5.6	0.4666	427.3	307.9
6.4	0.5333	532.4	383.6
7.2	0.6	630.6	454.4
8	0.6666	730.2	526.2
8.8	0.7333	850.4	612.8
9.6	0.8	980.2	706.3
10.4	0.8666	1110.2	800.0
11.2	0.9333	1235.6	890.3
12	1	1382.4	996.1
12.8	1.0666	1517.4	1094.8
13.6	1.1333	1679.6	1210.3
14.4	1.2	1821.1	1312.2
15.2	1.2666	1963.4	1414.8
16	1.333	2142.9	1544.1
16.8	1.4	2301.1	1658.1
17.6	1.4666	2460.6	1773.0
18.4	1.533	2643.0	1904.5
19.2	1.6	2839.5	2046.1
20	1.6666	3006.8	2166.6
20.8	1.7333	3198.1	2304.5
21.6	1.8	3386.6	2440.3
22.4	1.8666	3565.2	2569.0
23.2	1.9333	3780.1	2723.8
24	2	3976.4	2865.3

Table of gallons per minute UK shall be chosen because numbers are bigger. Maximum value of ACCULEVEL is 65535. Allowing entering values with one decimal, maximum is 28653= 2865.3.

Figure shows bloc of value to be entered to set FLUME 24 inches high by 9 inches wide. If click represent 100 gallons UK, frequency can be computed by 2856.3/60/100 = 0.644 sec. 1.56 Click par second.

Value of click is computed by: 16 (62.5mSec) * 60 (Value in GPM) * 10 (decimal) * 100 (units) =960000. Maximum value of FLUME CLICK is 16711680 then acceptable. If value required is in cubic meters: we just have to convert CLICK value respecting maximum value allowed.

FLUME SETTING HEIGHT BETWEEN POINT MAX 65535		FLOW	Gallon UK	/	Min
64		Click value xxxxx 16711680 MAX	960000		

FLUME SETTING TABLE 65535 MAX ADJUST Click value for multiplier x.xxx

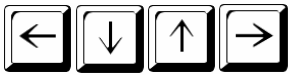
1	138	11	6128	21	16581
2	411	12	7063	22	17730
3	843	13	8000	23	19045
4	1297	14	8903	24	20461
5	1830	15	9961	25	21666
6	2446	16	10948	26	23045
7	3079	17	12103	27	24403
8	3836	18	13122	28	25690
9	4544	19	14148	29	27238
10	5262	20	15441	30	28653

This table is available by using PC and ACCUSYSTEM software. It is possible to enter values in ACCULEVEL using MASTER CONTROLLER too.

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
Mod. H Between PT  ?
MM/DD/YY WD HH:MM:SS
```

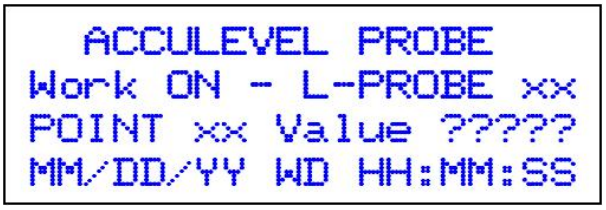
Pressing will show following screen.

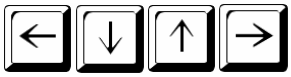
```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
H. Between PT. ?????
MM/DD/YY WD HH:MM:SS
```

Using keys  it is possible to modify FLUME step value. (Value between steps of flume in height of liquid, multiple of 0.0125")

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
Pt. to Modify     ??
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.



Using keys  it is possible to modify all FLUME point (30) values. By the fact adjusts curve of FLUME.

To allow ACCULEVEL to compute flow values it needs a conversion factor with decimal position. Figure shows conversion factors if FLUME is calibrated in Gallons per minutes (UK).

0		Digit after period
Conversion flow table 2147483647 MAX		10 max
Liter/Sec	757682	8
Liter/Min	4546092	7
Liter/Hour	2727655	5
M3/Min	4546092	10
M3/Hour	2727655	8
P3/Sec	2675729	10
P3/Min	1605437	8
P3/Hour	9632623	7
G UK/Sec	1666667	9
G UK/Min	1	1
G UK/Hour	60	1
G US/Sec	2001584	9
G US/Min	120095	6
G US/Hour	7205703	6
1K G UK/Day	1440	4
1K G US/Day	1729369	7
1K M3/Day	6546372	10

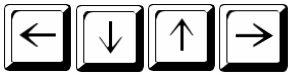
Two following screen allows to set conversion factors

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Mod. FLOW Table    ?
MM/DD/YY WD HH:MM:SS
```

Pressing will show following screen.

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Litre/Sec ??????????
MM/DD/YY WD HH:MM:SS
```

Pressing will show Programmed value.

Using Keys  it is possible to modify conversion factor of ACCULEVEL for each available Flow measurement.

When value is validated following screen is shown. You can adjust decimal value. Number of decimal may be changed if required.

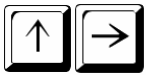
```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Decimal POSITION  ??
MM/DD/YY WD HH:MM:SS
```

NOTE: Do not forget that decimal value must include decimal we used in entering FLUME step values.

NOTE: FLUME CLICK is used to record quantity of liquid passed trough flume. Flow is only information in real time of how many units of liquid is passing trough.

Section 6: **Monitoring ACCULEVEL**

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Modify ?????? Listen
MM/DD/YY WD HH:MM:SS
```

If one of those keys  is pressed following screen will show.

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Listen Actual Val. ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed next screen shows actual value in STEP of ACCULEVEL

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Actual Value    xxxxx
MM/DD/YY WD HH:MM:SS
```

(xx) is replaced by value of STEP
One step usually equal 0.0125” water column.

STEP’s are transformed in inches

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Listen Val INCHES  ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed next screen shows actual value in inches.

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Val INCHES    xxx.xxx
MM/DD/YY WD HH:MM:SS
```

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Listen Val. MM     ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed next screen shows actual value in millimeters

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Millimeter xxxxx.xxx
MM/DD/YY WD HH:MM:SS
```

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
Listen Val. 4/20ma ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed next screen shows actual value in mA (0-65535) of ACCULEVEL mA output. 4mA=0

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
4/20ma Value  xxxxxx
MM/DD/YY WD HH:MM:SS
```

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
Listen FLUME CLICK ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed the <?> will be replaced by a big bloc every time MASTER CONTROLLER receives FLUME click from ACCULEVEL. This screen will stay on for 5 minutes and will be cleared. Big block is ON for 0.5 sec.

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
FLUME CLICK       ?
MM/DD/YY WD HH:MM:SS
```

Section 7: Viewing the totals of FLUME clicks and Flows

```
  ACCULEVEL PROBE
Work ON - L-PROBE xx
TOTAL CLICKs       ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed next screen will show total of FLUME CLICK's.

```
  ACCULEVEL PROBE
FLUME TOTAL CLICK
xxxxxxxxxxxxxxxxxxxx
MM/DD/YY WD HH:MM:SS
```

The 20 digits total click cannot be reset

```
  ACCULEVEL PROBE
FLUME TOTAL CLICK
SU- xxxxxxxxxxxxxxxx
MM/DD/YY WD HH:MM:SS
```

Days are shows by SU, MO, TE, WE, TH, FR, SA & PD
PD IS THE DAY BEFORE last week day.

Actual day accumulator is cleared when clock show 00:00.

If key is pressed next screen will show FLOW.

All following readings are available:

L/S	Liter per Second
L/M	Liter per minute
L/H	Liter per hour
M3/M	Cubic Meter per minute
M3/H	Cubic Meter per hour
P3/S	Cubic Foot per second
P3/M	Cubic Foot per minute
P3/H	Cubic Foot per hour
GUK/S	Gallon UK per second
GUK/M	Gallon UK per minute
GUK/H	Gallon UK per hour
GUS/S	Gallon US per second
GUS/M	Gallon US per minute
GUS/H	Gallon US per hour
MGUK/J	Thousand Gallons UK par jour
MGUS/J	Thousand Gallons US par jour
M-M3/J	Thousand Meters cube par jour

Because units are converted any other engineering value may be programmed on request.

To read Liter per Second

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Litre/Second       ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed following screen will show value of Litre per Second.

```
   ACCULEVEL PROBE
Work ON - L-PROBE xx
Litre/Sec 0000000.000
MM/DD/YY WD HH:MM:SS
```

Note: precision is with 3 decimals even if computation is with 10 decimals over decimals are not shown.

Section 8: Modification/Monitoring of ACCUBUBBLE PROBE

ACCUBUBBLE (BUBBLE PROBE) is used to monitor bubble emission in vertical tube used in an anaerobic digester to mix liquid in digester.

See Technical manual ACCUBUBBLE for more details

In ACCUBUBBLE monitoring system MASTER CONTROLLER is communicating with ACCUBUBBLE PROBE's and can programs or monitors each installed probe.

This section describe possible operations and their usages

When following screen is shown

```
    Select Module
     To Work on
     ACCUBUBBLE     ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed it allow adjusting parameters of ACCUBUBBLE (BUBBLE PROBE).

Following screen is shown

```
   ACCUBUBBLE PROBE
AUTO Reach B-PROBE ?
Specify #
MM/DD/YY WD HH:MM:SS
```

Probe may be reached automaticaly if key is pressed.

Or probe number may be entered with keyboard if key is pressed.

Screen of automatic search

```
   ACCUBUBBLE PROBE
AUTO search B-P   ??

MM/DD/YY WD HH:MM:SS
```

Automatic search will shows instead of (??) number of searched probe.

When an ACCUBUBBLE probe is found following screen is shown.

As example probe 4 is found

```
   ACCUBUBBLE PROBE
AUTO search B-P   ??
Found 04 B-Probe
MM/DD/YY WD HH:MM:SS
```

If Key is pressed search continue with next number.

If Key is pressed search restart with number 01

If Key is pressed probe is selected to work on and next screen is shown. (See page 49)

If Key is pressed Master Controller go back to first screen.

If searched module is not found screen will show

```
  ACCUBUBBLE PROBE
AUTO search B-P   60
Probe NOT On line
MM/DD/YY WD HH:MM:SS
```

It is possible to restart search by pressing

Even if search is specific, It still possible to restart search

Specific search screen

```
  ACCUBUBBLE PROBE
SPECIFY the B-PROBE
To Work ON 01-16  ??
MM/DD/YY WD HH:MM:SS
```

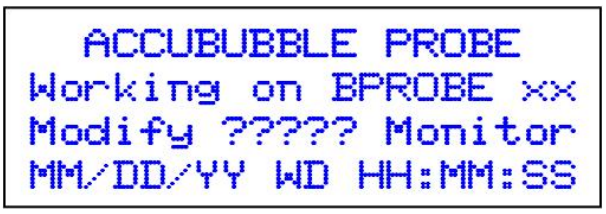
Using four keys you can enter number of specific probe to work ON.
(Possible value: 01 – 60)

When cursor is located at right most position and key is pressed validation over number entered is executed.

If probe is not connected following screen is shown.

```
  ACCUBUBBLE PROBE
SPECIFY the B-PROBE
Probe NOT On line
MM/DD/YY WD HH:MM:SS
```

NOTE: If search is done automatically of by specifying number and key is pressed following screen is shown.



(xx) is replaced by selected number

Pressing one of keys ← ↓ allows modifying parameters of ACCUBUBBLE.

Pressing one of keys ↑ → allows monitoring selected ACCUBUBBLE

List of parameters that can be modified

CHOICE	DESCRIPTION
- Nbr. : of the BPROBE	Allows modifying number (Address) of B-Probe
- LED ON time	Allows adjusting time of local LED is ON (Activity indicator)
- Debounce time	Allows adjusting time when B-Probe is not sensing after bubble has been detected
- PERIOD transfer time	Allows adjusting time of automatic sequencer which send PERIOD to RS-485 communication line

Following screens shows with more details what can be modified in ACCUBUBBLE PROBE.

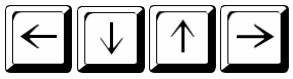
NBR (address) of B-Probe

```
   ACCUBUBBLE PROBE
Working on BPROBE xx
Number of BPROBE   ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed folowing screen is shown

(xx) is replaced by actual number of BPROBE

```
   ACCUBUBBLE PROBE
Working on BPROBE xx
Enter Nbr 01-60   ??
MM/DD/YY WD HH:MM:SS
```

Using keys,  it is possible to change probe number.

NOTE about modification of probe number:

It is impossible to change to new probe number if number already exist in system

Debounce Time

```
   ACCUBUBBLE PROBE
Working on BPROBE xx
Debounce Time      ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed folowing screen is shown

Setting debounce time

```
   ACCUBUBBLE PROBE
Working on BPROBE xx
Debounce Time    ????
MM/DD/YY WD HH:MM:SS
```

Using keys it is possible to modify debounce time of selected BPROBE. Value should be between 200 & 2000. Time is in milisecond and should not be greater than bubbling rate. This value stops probe to generate detection after bubble was detected to prevent eratic reading of bubbler.

Setting LED ON time in BPROBE

```
   ACCUBUBBLE PROBE
Working on BPROBE xx
LED ON Time          ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed folowing screen is shown

```
   ACCUBUBBLE PROBE
Working on BPROBE xx
LED ON Time      ????
MM/DD/YY WD HH:MM:SS
```

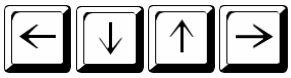
Using keys it is possible to modify time when LED located atop of BPROBE (Model Class I Division 2) or inside BPROBE (Model Class I Division 1) is illuminated. LED is local indication that bubble was generated. Value entered must be between 200 & 5000 (.02 Sec. to 5 Sec.)

Setting repetitive transfer timing of period value

```
   ACCUBUBBLE PROBE
Working on BPROBE xx
Trans. Period Time ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed folowing screen is shown

```
   ACCUBUBBLE PROBE
Working on BPROBE xx
Tx-Period Time ?????
MM/DD/YY WD HH:MM:SS
```

Using keys  it is possible to modify transfer time of period value (time between bubbles) this function is not used with MASTER CONTROLLER but required when ACCUSYSTEM SOFTWARE is used (Refer to software for more details) Accepted value is between 5000 and 60000. (5 seconds to 60 seconds)

ACCUBUBBLE Monitoring

When following screen is shown

```
   ACCUBUBBLE PROBE
Working on BPROBE xx
Modify ????? Monitor
MM/DD/YY WD HH:MM:SS
```

Pressing one of keys allows monitoring selected ACCUBUBBLE

Only two items can be monitor in ACCUBUBBLE

Following screen is to select monitoring of bubble.

```
   ACCUBUBBLE PROBE
Working on BPROBE xx
Monitor Bub. Act.  ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed following screen is shown

```
   ACCUBUBBLE PROBE
Working on BPROBE xx
Monitoring BUBBLE  _
MM/DD/YY WD HH:MM:SS
```

When a bubble is detected (_) is replaced by a big block.
Big block stays ON for one second.
Display is shown for 5 minutes

If key is pressed following screen will show

MONITORING period between bubbles

```
   ACCUBUBBLE PROBE
Working on BPROBE xx
Monitor PERIOD     ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed folowing screen is shown

```
   ACCUBUBBLE PROBE
Working on BPROBE xx
BUBBLE PERIOD ??.???
MM/DD/YY WD HH:MM:SS
```

(xx.xxx) is replaced by period value of selected ACCUBUBBLE. Screen will stays for 5 minutes, if no key is pressed. Value of period is update every 0.5Sec.

Pressing a key will show first MASTER CONTROLLER screen.

Section 9: Modification/control of OUTPUT BOARD

OUTPUT BOARD included in ACCUSYSTEM is primarily used to interface signals from ACCUBUBBLE's to outside world. Those signals can be connected to PLC allowing SCADA to be implemented.

OUTPUT BOARD can also be used to implement control to elements using output lines programmed as alarms for too short or too long period of ACCUBUBBLE's.

Output lines may also programmed to be used as control lines for switching ON-OFF elements, one shot timers or sequencers

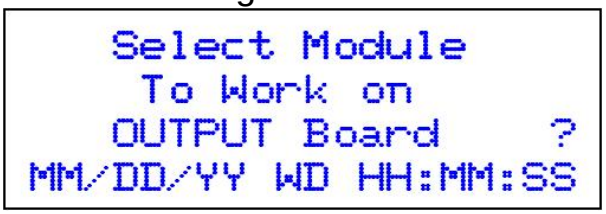
Polarity of signals may be positive or negative.

See: Technical manual of OUTPUT BOARD for more details

In installation of an ACCUSYSTEM monitoring bubbles or others, MASTER CONTROLLER can communicate with OUTPUT BOARD and programs each of 24 points available.

This section describes such operations and their possible usages.

When following screen is shown



If key is pressed it activate this choice and allows changing OUTPUT BOARD parameters

Next screen will be shown.

Selection of OUTPUT BOARD

```
     OUTPUT BOARD
AUTO Search O-B     ?
Specify #
MM/DD/YY WD HH:MM:SS
```

OUTPUT BOARD may be automaticaly reasearch by pressing key

or number specified using key

AUTOMATIC search screen

```
     OUTPUT BOARD
AUTO Search O-B    ??

MM/DD/YY WD HH:MM:SS
```

During automatic search (xx) is replaced by found module

If an OUTPUT BOARD is found following screen is shown.
Example show finding of OUTPUT BOARD # 03

```
     OUTPUT BOARD
AUTO Search O-B    03
Found 03 OUTPUT-B
MM/DD/YY WD HH:MM:SS
```

If Key is pressed search continue with next number.

If Key is pressed search restart with number 01

If Key is pressed OUTPUT is selected to work on and next screen is shown. (See page 58)

If Key is pressed Master Controller go back to first screen.

If OUTPUT is not found following screen is shown

```
     OUTPUT BOARD
AUTO Search O-B   16
OUTPUT-B Not Found
MM/DD/YY WD HH:MM:SS
```

With that screen it is possible to restart an auto search starting with 01 by pressing

Even if it is a specific research restarting an auto search is possible.

Specific search screen

```
     OUTPUT BOARD
Specify OUTPUT BOARD
to Work ON 01-16  ??
MM/DD/YY WD HH:MM:SS
```

Using four key, it is possible to enter number of specific O-B (Permissible value 01-16)

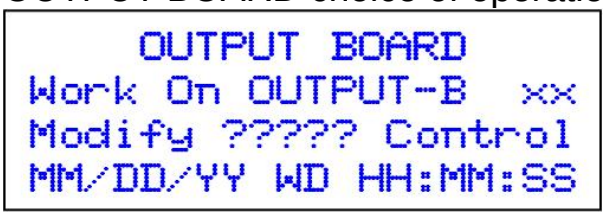
When cursor is located at most right position pressing will start a research on specific module.

If research in not successful following screen will be shown

```
     OUTPUT BOARD
AUTO Search O-B   16
OUTPUT-B Not Found
MM/DD/YY WD HH:MM:SS
```

NOTE: If search was executed automatically or specifically and key pressed following screen is shown.

OUTPUT BOARD choice of operation



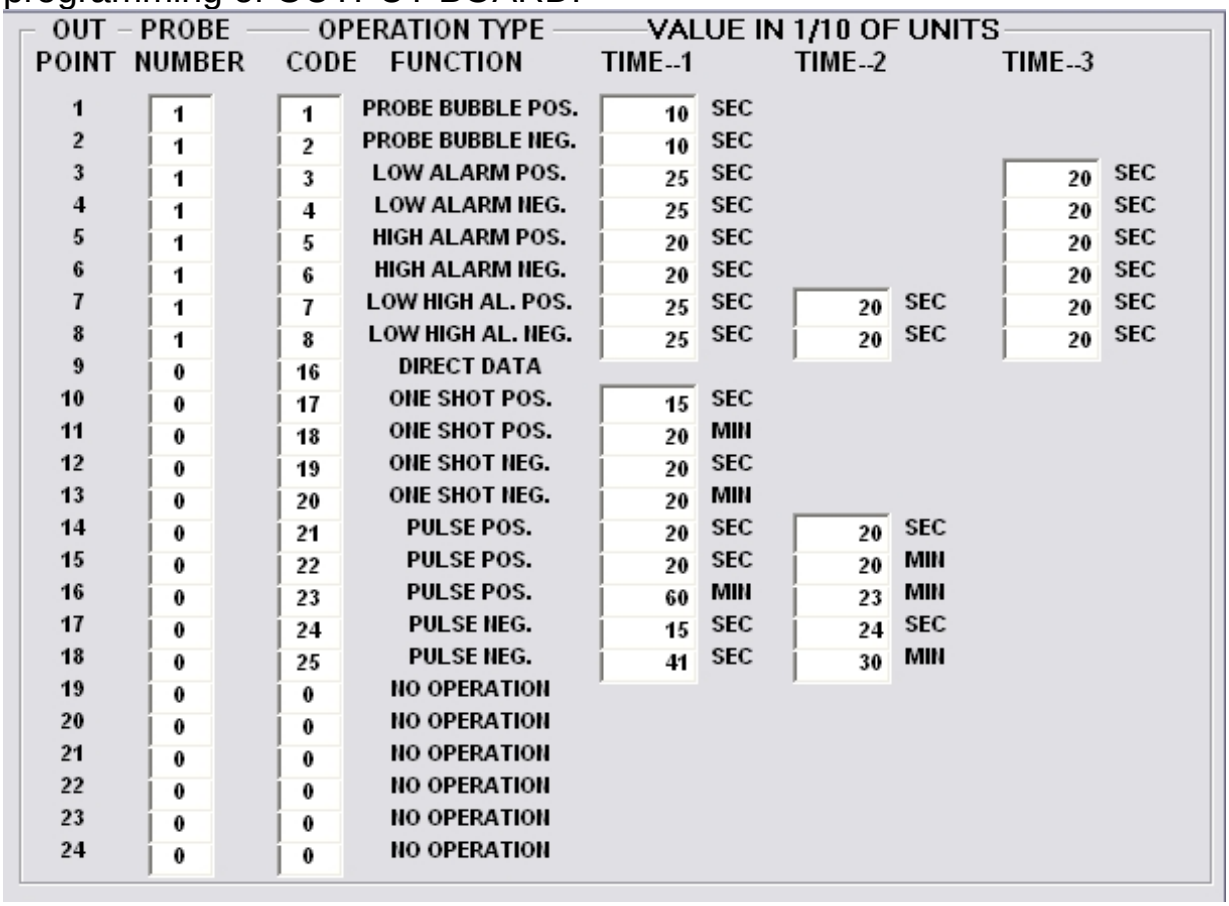
Number of O-B replaces the (xx)

Pressing one of keys ← ↓ allows modifying parameters of OUTPUT BOARD.

Pressing one of keys ↑ → allows exercising control with selected OUTPUT BOARD

If one of keys ← or ↓ is pressed modification of OUTPUT parameters is selected.

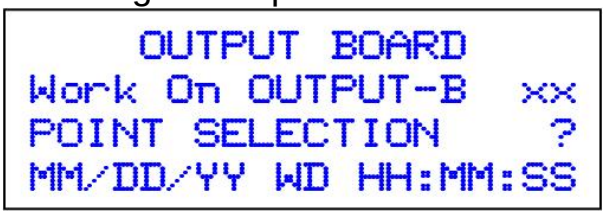
For reference information's, picture of ACCUSYSTEM software in programming of OUTPUT BOARD.



OUT POINT	PROBE NUMBER	OPERATION TYPE CODE	FUNCTION	VALUE IN 1/10 OF UNITS TIME--1		TIME--2		TIME--3	
1	1	1	PROBE BUBBLE POS.	10	SEC				
2	1	2	PROBE BUBBLE NEG.	10	SEC				
3	1	3	LOW ALARM POS.	25	SEC			20	SEC
4	1	4	LOW ALARM NEG.	25	SEC			20	SEC
5	1	5	HIGH ALARM POS.	20	SEC			20	SEC
6	1	6	HIGH ALARM NEG.	20	SEC			20	SEC
7	1	7	LOW HIGH AL. POS.	25	SEC	20	SEC	20	SEC
8	1	8	LOW HIGH AL. NEG.	25	SEC	20	SEC	20	SEC
9	0	16	DIRECT DATA						
10	0	17	ONE SHOT POS.	15	SEC				
11	0	18	ONE SHOT POS.	20	MIN				
12	0	19	ONE SHOT NEG.	20	SEC				
13	0	20	ONE SHOT NEG.	20	MIN				
14	0	21	PULSE POS.	20	SEC	20	SEC		
15	0	22	PULSE POS.	20	SEC	20	MIN		
16	0	23	PULSE POS.	60	MIN	23	MIN		
17	0	24	PULSE NEG.	15	SEC	24	SEC		
18	0	25	PULSE NEG.	41	SEC	30	MIN		
19	0	0	NO OPERATION						
20	0	0	NO OPERATION						
21	0	0	NO OPERATION						
22	0	0	NO OPERATION						
23	0	0	NO OPERATION						
24	0	0	NO OPERATION						

OUTPUT BOARD is build with 24 (OUT POINT), 18 operating modes per point & 3 time bases.

First operation is to select point to work on. Following screen allows choosing select point.



If key → is pressed allows selecting POINT to be modified. following screen is shown

```
     OUTPUT BOARD
Work On OUTPUT-B  xx
Enter POINT 01-24 ??
MM/DD/YY WD HH:MM:SS
```

Using keys, ← ↓ ↑ → it is possible selecting point to work ON.

When cursor is positioned at right most position:

Pressing → key allows selecting point wich can be modified.

Modification of POINT must be completed before anotherone can be selected.

Following screen is shown

```
     OUTPUT BOARD
Work On OUTPUT-B  xx
POINT xx B-PROBE  ??
MM/DD/YY WD HH:MM:SS
```

Using the keys, ← ↓ ↑ → it is possible to select which ACCUBUBBLE is assigned to that point (Permitted value 00-60)

When cursor is positioned at right most position:

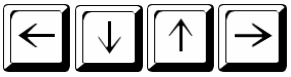
Pressing → key select point with ACCUBUBBLE assignation.

If value B-PROBE is 00 this select control mode (no ACCUBUBBLE is selected). See page 63

Following screen is shown

```
     OUTPUT BOARD
Work On OUTPUT-B  xx
POINT xx OP-CODE  ??
MM/DD/YY WD HH:MM:SS
```

9 codes can be programmed (00-08). Actual code is shown at place of (??).
If code is not permitted it will be replaced by 00
(NO OPERATION)

Using keys,  it is possible to enter desired code (00-08)

When cursor is positioned at right most position:

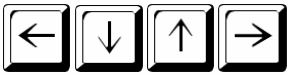
Pressing key allows continue setting of point.

If code selected is 00 see page 59. Selection of point

Following is continuing of parameters modification, setting of time #1 (if code is not 00)

Following screen is shown

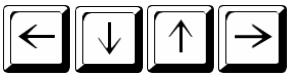
```
     OUTPUT BOARD
Work On OUTPUT-B  xx
POINT xx Time1 ?????
MM/DD/YY WD HH:MM:SS
```

Using keys,  it is possible to enter time that output is activated. Permissible value: 01-65535.
When cursor is positioned at right most position:

Pressing key if mode is 01 or 03 see page 59 Point Selection.

If code is 03, 04, 05, 06 you must set time #3. Duration of sustain alarm. Following screen is shown

```
     OUTPUT BOARD
Work On OUTPUT-B  xx
POINT xx Time 3  ???
MM/DD/YY WD HH:MM:SS
```

Using keys,  it is possible to enter time of sustain alarm when alarm is deactivated. (Permissible value 01-255)

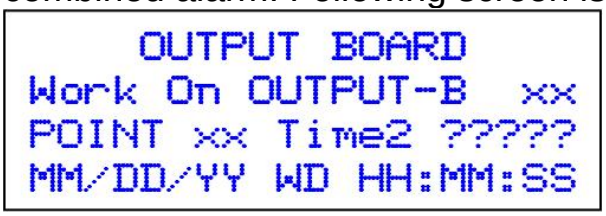
When cursor is positioned at right most position:

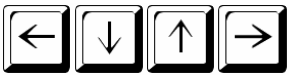
Pressing key will show selection of point See page 59

DESCRIPTION OF POSSIBLE CODE From 0 to 8

Operation Code	Description
0	NO Operation
1	Positive Follow of PROBE nbr. with T1
2	Negative Follow of PROBE nbr with T1
3	Alarm: period too short positive PROBE nbr with T1—T3
4	Alarm: period too short negative PROBE nbr with T1—T3
5	Alarm: period too long positive PROBE nbr with T1—T3
6	Alarm: period too long negative PROBE nbr with T1-T3
7	Alarm period too short or too long positive PROBE nbr with T1—T2—T3
8	Alarm period too short or too long negative PROBE nbr with T1—T2—T3

If code is 07 or 08, time #2 may be adjusted. Value of time is long limit of combined alarm. Following screen is shown



Using keys,  it is possible to enter time of too long period. (Permissible value 01-65535)

Pressing key will show point selection. See page 59

If B-PROBE is 0, it is possible to program controlable points.

11 control codes are available (16-26). Possible code are shown by replacing the (??). If code is imposible it will be replaced by 00.

If code is 16, It is possible to activate or desactivate output.
See page 68

If code is 17, 18, 19, 20, one time delay is available. It is possible to start or stop delay using control section. See page 68

If code is 21 to 26, sequencer ON-OFF can be programmed, Started or stopped using control section. See page 68

Programmable codes 16-26
Those operation mode may requierd to adjust time 0-2 depending of choosen code.

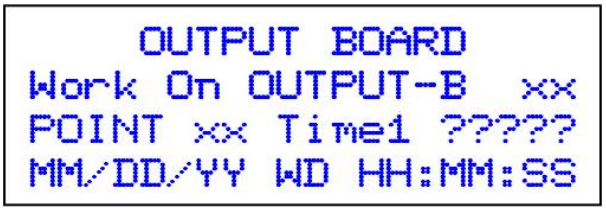
Code 16 (DIRECT DATA) do not need time value. Code 17-20 need one time base (T1). Code 21-26 need two time base (t1.T2)

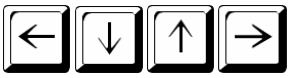
Following show operation,s in relation with codes

CODE	Description	Time 1	Time 2
16	Direct Data	n/a	n/a
17	Positive Timer (One shot) second	1-65535	n/a
18	Positive Timer (One shot) minute	1-65535	n/a
19	Negative Timer (One shot) seconds	1-65535	n/a
20	Negative Timer (One shot) minute	1-65535	n/a
21	Sequencer positive ON-OFF sec. sec	1-65535	1-65535
22	Sequencer positive ON-OFF min. sec	1-65535	1-65535
23	Sequencer positive ON-OFF min. min	1-65535	1-65535
24	Sequencer negative OFF-ON sec. sec	1-65535	1-65535
25	Sequencer negative OFF-ON sec. min.	1-65535	1-65535
26	Sequencer negative OFF-ON min. min	1-65535	1-65535

Example of sequencer positive ON-OFF second, second. CODE 21

If code is 21 was entered, following scren will be shown.

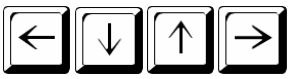


Using keys,  it is possible to enter time when output will be ON. Permissible values 01-65535

When cursor is positioned at right most position:

Pressing key will show following screen.

```
     OUTPUT BOARD
Work On OUTPUT-B  xx
POINT xx Time2 ?????
MM/DD/YY WD HH:MM:SS
```

Using keys,  it is possible to enter time when output will be OFF. Permissible values 01-65535

When cursor is positioned at right most position:

Pressing key will Show selection screen. See page 59

NOTE about value of T1-T3:

In most case value entered is in 1/10 of second. Some others entries are in 1/10 of minute.

HOW TO DO CONTROL USING CONTROLLABLE POINTS OF OUTPUT BOARD

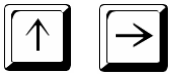
All controllable points of OUTPUT BOARD need intervention by operator.

When following screen is shown

```
     OUTPUT BOARD
Work On OUTPUT-B  xx
Modify ????? Control
MM/DD/YY WD HH:MM:SS
```

(xx) is replaced by number of OUPUT BOARD

Pressing one of keys allows modifying parameters of OUTPUT BOARD. (See page 58)

Pressing one of keys  allows to exercise control with selected OUTPUT BOARD Following screen is shown

```
     OUTPUT BOARD
Work On OUTPUT-B  xx
Research PT #   AUTO
MM/DD/YY WD HH:MM:SS
```

If key is pressed an auto search is start to find first controllable point. Following screen is shown if no controllable point is found.

End of search without finding controllable point.

```
     OUTPUT BOARD
Work On OUTPUT-B  xx
Point xx NO Control
MM/DD/YY WD HH:MM:SS
```

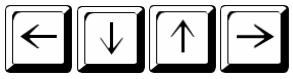
(xx) is replaced by 1-24 point value

When screen show:

```
     OUTPUT BOARD
Work On OUTPUT-B  xx
Research PT #   AUTO
MM/DD/YY WD HH:MM:SS
```

Pressing key allows entering point number to control it. Following screen is shown

```
     OUTPUT BOARD
Work On OUTPUT-B  xx
Specify Point     ??
MM/DD/YY WD HH:MM:SS
```

Using keys,  it is possible to enter Point to be controlled. Possible value 01-24

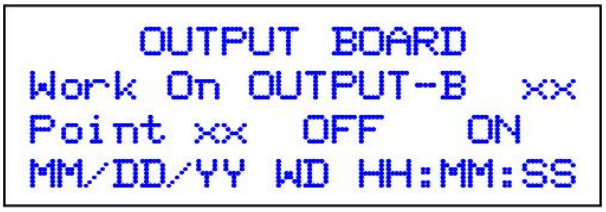
When cursor is positioned at right most position:

Pressing key will show following screen if point is not controllable

```
     OUTPUT BOARD
Work On OUTPUT-B  xx
Point xx NO Control
MM/DD/YY WD HH:MM:SS
```

or if point is controllable:

Point is controlable



Pressing key ↓ point will be set to OFF or STOP

Pressing Key ↑ point will be set to ON or START

If key → is pressed start research for next controllable point will

If key ← is pressed screen will show first MASTER CONTROLLER screen.

Note: Belcatec Design Inc. never intend to build PLC using OUTPUT BOARD and MASTER CONTROLER but just allows first line control using few parts. Basic idea is to be able to control cleaning valves for bubbles generator or other accessories.

Section 10: Modification of MIMIC BOARD

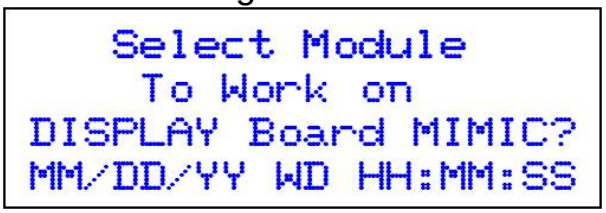
Function of MIMIC BOARD display is to show in real time and in centralized point activity of BUBBLE generators, using bubble mixer in anaerobic digester. Display is usually built using LED's which are illuminated when bubble is detected by ACCUBUBBLE PROBE. Because of most different installation LED panel construction is adapted for installation. MIMIC BOARD module allows this installation adaptation.

MASTER CONTROLLER allows adjusting parameters in relation of installation.

MIMIC board can accommodates 40 LED's in scheme 8 rows by 5 columns. Usually it is not needed to do modification in that arrangement (It is factory configured by Belcatec Design Inc.) The Next screen allows making adjustment to original set-up.

Section describe how to make modifications and their usages

When following screen is shown



Pressing key activate choice allowing to configure MIMIC BOARD

Up to 16 MIMIC BOARD may be installed in ACCUSYSTEM

Following screen is SHOWN.

Selecting MIMIC BOARD

```
DISPLAY Board MIMIC
AUTO Search MIMIC  ?
Specify #
MM/DD/YY WD HH:MM:SS
```

MIMIC May be researched automatically by pressing

Or enter specific number by pressing

AUTO search of mimic.

```
DISPLAY Board MIMIC
AUTO Search MIMIC xx

MM/DD/YY WD HH:MM:SS
```

During auto search module number will replace (xx)

If MIMIC BOARD is found following screen is shown

Example MIMIC BOARD #3

```
DISPLAY Board MIMIC
AUTO Search MIMIC 03
Found 03 MIMIC BOARD
MM/DD/YY WD HH:MM:SS
```

If key is pressed search goes on

If key is pressed search restart with 01

If key is is pressed module is chosen to work on and following screen shown Page 74 (CHANGE NUMBER)

If key is pressed MASTER CONTROLLER show first screen.

In case search module is not present following screen is shown

```
DISPLAY Board MIMIC
AUTO Search MIMIC 16
MIMIC NOT connected
MM/DD/YY WD HH:MM:SS
```

With this screen shown it is possible to restart auto search by pressing

If search was specific it is also possible to restart automatic search

Specific search

```
DISPLAY Board MIMIC
Specify MIMIC BOARD
to Work ON 01-16  ??
MM/DD/YY WD HH:MM:SS
```

Using the four keys it is possible to enter number of mimic to work with. (Permissible value 01-16)

When cursor is located at most right position pressing will start search to validate specified MIMIC BOARD.

If module is not found following screen is shown

```
DISPLAY Board MIMIC
AUTO Search MIMIC 16
MIMIC NOT connected
MM/DD/YY WD HH:MM:SS
```

NOTE if search was Specific or Automatic pressing key will show following screen

```
DISPLAY Board MIMIC
Work on MIMIC-B   xx
Nbr of MIMIC BOARD ?
MM/DD/YY WD HH:MM:SS
```

Selected number will replace (xx)

Pressing allows modifying number of module MIMIC BOARD

(See next page)

Pressing will show following screen to adjust LED on timing

```
DISPLAY Board MIMIC
Work on MIMIC-B   xx
LED's set time ON  ?
MM/DD/YY WD HH:MM:SS
```

Pressing allows modifying illumination time of LEDs

(See page 75)

Pressing shows following screen to adjust assignation of ACCUBUBBLE to LED.

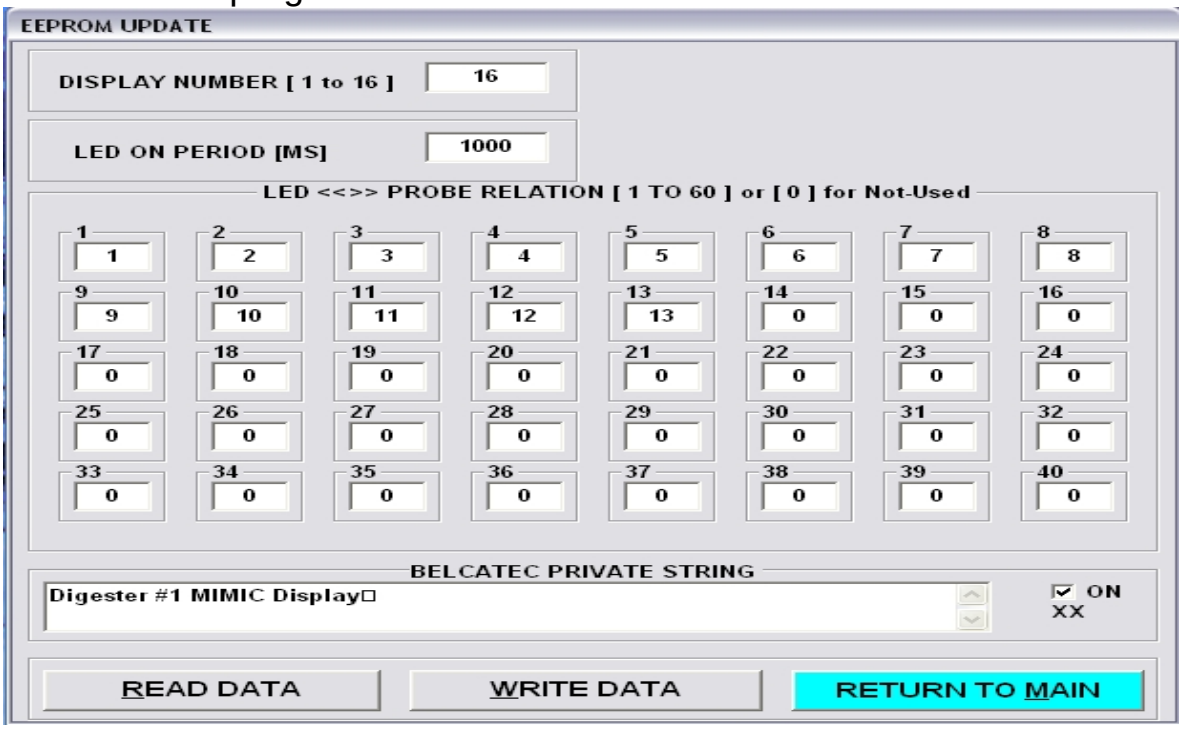
```
DISPLAY Board MIMIC
LEDs Assignation
LED xx ACCUBUBBLE ??
MM/DD/YY WD HH:MM:SS
```

Entire set of 40 LEDs must be completed to get out of this mode

Number of LED is shown in place of (xx)

Using the four keys it is possible to enter number of ACCUBUBBLE which will illuminates LED Permissible value 00-60.
If 00 is entered LED is not assigned and will remain off.

Following figure for reference only; is part of ACCUSYSTEM SOFTWARE use on PC to program MIMIC BOARD.



In software screen only 13 ACCUBUBBLEs are present using two rows

When last position (40) is adjusted starting screen of MASTER CONTROLLER is shown.

Modify number of MIMIC BOARD

```
DISPLAY Board MIMIC
Work ON MIMIC-B   xx
Enter Number M-B  ??
MM/DD/YY WD HH:MM:SS
```

Using the four keys it is possible to modify number (address) of MIMIC BOARD

NOTE about changing number of MIMIC BOARD:
If number already exists in system trying to use same will not work. Same address can not be applied for more then one module.

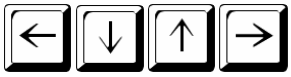
When cursor is localized at right most position of digit and key is pressed Master Will try to find module with same address, If not found module number will be changed and following screen is shown.

```
DISPLAY Board MIMIC
Work ON MIMIC-B   xx
Set-up LED ON TIME ?
MM/DD/YY WD HH:MM:SS
```

Pressing key allows modifying time LEDs are illuminated

Adjustment of time LEDs are ON

```
DISPLAY Board MIMIC
Work ON MIMIC-B   xx
Enter LED TIME  ????
MM/DD/YY WD HH:MM:SS
```

Using keys  it is possible to modify time period where LEDs are turn ON

Acceptable value must be between 200 & 5000 (0.2Sec to 5 Sec)

When cursor is located at right most position and key is pressed modifications will continue with assignation of ACCUBUBBLE to LED's See page 73

NOTE it is possible to assign more than one LED to same ACCUBUBBLE.

Section 11: Modification/Monitoring d'ACCUPRESSURE

ACCUPRESSURE module is used for pressure sensor & controller for measuring vacumm/pressure. This is ideal equipment to secure gas compressor in installation of gas recirculation in anaerobic digester. Using two modules, one for entry (Suction) and one at exit (Pressure), a security system with digital and analog signals can be implemented.

It is also possible using ACCUPRESSURE to control pressure in low pressure reservoir.

MASTER CONTOLER allows changing parameters in ACCUPRESSURE.

Similar as ACCULEVEL; ACCUPRESSURE may be used in process control of other equipments. Most of the operations are similar of ACCULEVEL.

When following screen is shown and is pressed

```
    Select Module
     To Work on
    ACCUPRESSURE    ?
MM/DD/YY WD HH:MM:SS
```

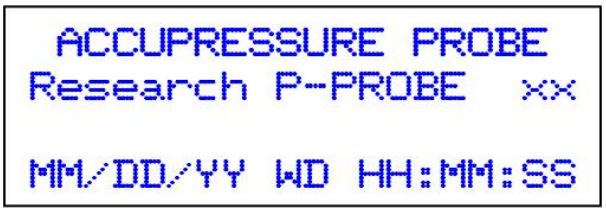
Following screen is shown

```
 ACCUPRESSURE PROBE
Research P-PROBE   ?
Specify #
MM/DD/YY WD HH:MM:SS
```

Pressing will search automatically to find PRESSURE PROBE

or number may be entered manually by pressing

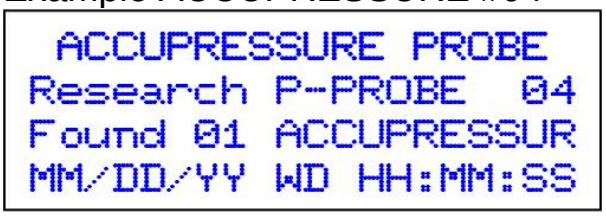
Automatic research screen



During automatic research number search for is replacing (xx)

If ACCUPRESSURE is present following screen is shown.

Example ACCUPRESSURE #04



Pressing key will continue research

Pressing key will restart research with module 01

Pressing key will select module to work on and following screen is shown (last of next page)

Pressing key will return MASTER CONTROLLER to it first screen

In case search module is not present following screen is shown

```
  ACCUPRESSURE PROBE
Research P-PROBE  16
P-P Not connected
MM/DD/YY WD HH:MM:SS
```

It is possible to restart search by pressing key

If it was specific search it still possible to restart auto searches.

Specific research

```
  ACCUPRESSURE PROBE
Specify Press-Probe
to Work on 01-16  ??
MM/DD/YY WD HH:MM:SS
```

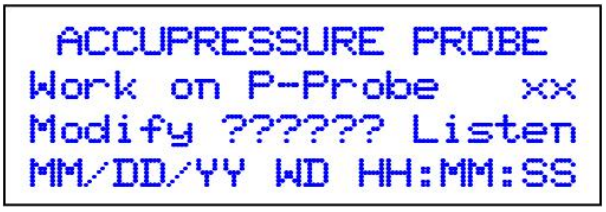
Using the four keys it is possible to enter number of ACCUPRESSURE to work on (permissible value 01-16)

When cursor is located at most right digit pressing key will initiate search for that module

If module is not present following screen is shown

```
  ACCUPRESSURE PROBE
Research P-PROBE  16
P-P Not connected
MM/DD/YY WD HH:MM:SS
```

NOTE: Either search is automatic or specific, and module found pressing key → will show following screen.



(xx) is replaced by ACCUPRESSURE number

Pressing key ← or ↓ allows to modify parameters of ACCUPRESSURE PROBE.

Pressing key ↑ or → allows to listen (Monitor) selected ACCUPRESSURE PROBE.

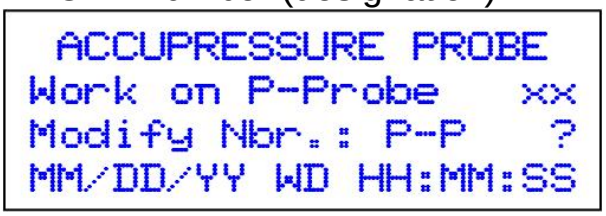
Following list of modifiable parameters of ACCUPESSURE PROBE

CHOICE	DESCRIPTION
- Nbr. : of PPROBE	Modify address of P-Probe
- Operation Mode	Modify mode of operation Always (0) reserved
- Mod. : P1 ON Set Point	Adjust PRESSURE 1 turn ON
- Mod. : P1 OFF Set Point	Adjust PRESSURE 1 turn OFF
- Mod. : P2 ON Set Point	Adjust PRESSURE 2 turn ON
- Mod. : P2 OFF Set Point	Adjust PRESSURE 2 turn OFF
- Mod. : P3 ON Set Point	Adjust PRESSURE 3 turn ON
- Mod. : P3 OFF Set Point	Adjust PRESSURE 3 turn OFF
- Fix K1 mode	Allow to assign output K1
- Fix K2 mode	Allow to assign output K2
- Fix OPTO mode	Allow to assign output OPTO
- Mod. : OFFSET value	Allows to set negative (Vacuum) limit
- Mod. : INCHES/STEP	Allows to set water column step value in inches

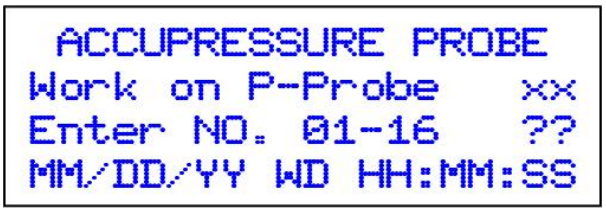
- Mod. : MM/STEP	Allows to set water column step value in millimeters
- Mod. : 4-20 STEP	Allows to set multiplication of step to mA
- Mod.: Mod. CAL. Val.	Allows to set calibration value to get zero
- Mod.: ENG. Value	Allows setting what type of measure are shown on screen of ACCUPRESSURE

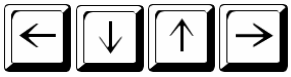
Following screens shows with more details any possible modification to ACCUPRESSURE PROBE.

PROBE number (designation)



Pressing key will show following screen



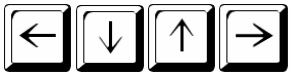
Using keys  it is possible to enter new number for ACCUPRESSURE PROBE.

Note about modification of parameters of P-PROBE:

Modification of P-PROBE are requiring unlocking numbered key

If on third line you can read:

```
ENTER KEY          0000
```

Using keys  it possible to enter key numbers

To obtains key code ask your foreman or call Belcatec Design Inc. (514) 645-6353 (Ask for René)

Modification of module number is not possible if in system number already exist.

Note about pressure level detection and set point.

ACCUPRESSURE have three levels which can be adjusted with going ON set point and going OFF set point.

If both set points are programmed at same value level output may become unstable when pressure is reached.

A gap is preferable.

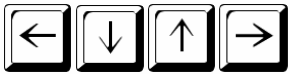
Pattern may be ON-OFF or OFF-ON. Following screen shows how to adjust those parameters.

Adjustment Level 1 ON

```
  ACCUPRESSURE PROBE
Work on P-Probe    xx
Modify Level 1 ON   ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed folowing screen is shown

```
  ACCUPRESSURE PROBE
Work on P-Probe    xx
Level 1 ON VAL  ?????
MM/DD/YY WD HH:MM:SS
```

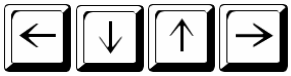
Using keys  it is possible to modify level 1 ON value.

Adjustment Level 1 OFF

```
  ACCUPRESSURE PROBE
Work on P-Probe    xx
Modify Level 1 OFF ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed folowing screen is shown

```
  ACCUPRESSURE PROBE
Work on P-Probe    xx
Level 1 OFF V. ?????
MM/DD/YY WD HH:MM:SS
```

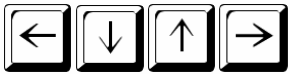
Using keys  it is possible to modify level 1 OFF value.

Adjustment Level 2 ON

```
  ACCUPRESSURE PROBE
Work on P-Probe    xx
Modify Level 2 ON  ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed folowing screen is shown

```
  ACCUPRESSURE PROBE
Work on P-Probe    xx
Level 2 ON VAL ?????
MM/DD/YY WD HH:MM:SS
```

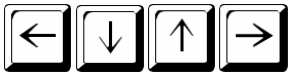
Using keys  it is possible to modify level 2 ON value.

Adjustment Level 2 OFF

```
 ACCUPRESSURE PROBE
Work on P-Probe   xx
Modify Level 2 OFF ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed folowing screen is shown

```
 ACCUPRESSURE PROBE
Work on P-Probe   xx
Level 2 OFF V. ?????
MM/DD/YY WD HH:MM:SS
```

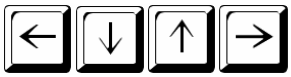
Using keys  it is possible to modify level 2 OFF value.

Adjustment Level 3 ON

```
 ACCUPRESSURE PROBE
Work on P-Probe   xx
Modify Level 3 ON  ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed folowing screen is shown

```
 ACCUPRESSURE PROBE
Work on P-Probe   xx
Level 3 ON VAL ?????
MM/DD/YY WD HH:MM:SS
```

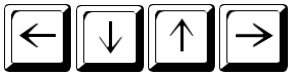
Using keys  it is possible to modify level 3 ON value.

Adjustment Level 3 OFF

```
  ACCUPRESSURE PROBE
Work on P-Probe    xx
Modify Level 3 OFF ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed folowing screen is shown

```
  ACCUPRESSURE PROBE
Work on P-Probe    xx
Level 3 OFF V. ?????
MM/DD/YY WD HH:MM:SS
```

Using keys  it is possible to modify level 3 OFF value.

NOTE: Over operating ON-OFF OFF-ON levels:

If set point ON is lower than set point OFF, if level is lower than ON set point, output will goes ON. When level reaches OFF set point, output goes OFF and goes ON again when level is lower than ON set point. (May be used to pressure up reservoir)

In counter part:

If set point OFF is lower than set point ON, if level is lower than OFF set point, output is set OFF. When level reaches ON set point, output goes ON and goes OFF again when level is lower than OFF set point. (May be used to empty reservoir)

Setting value ON-OFF with a small variation allows using ACCULEVEL as pressure detector. (Three different levels are programmable)

ACCUPRESSURE is assembled with three digital output (K1, K2, OPTO)
See Technical Manuel of ACCUPRESSURE for more details)

Assignation output K1

```
  ACCUPRESSURE PROBE
Work on P-Probe    xx
SET K1 OUTPUT MODE ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed folowing screen is shown

```
  ACCUPRESSURE PROBE
Work on P-Probe    xx
Enter K1 MODE 0-3  ?
MM/DD/YY WD HH:MM:SS
```

Using keys it is possible to modify assignation of K1.

Four modes are available for three outputs of ACCUPRESSURE

K1, K2 & OPTO

Mode	Description
0=	Always OFF
1=	Level 1
2=	Level 2
3=	Level 3

More than one output may be affected at same Level

Depending on ACCUPRESSURE model some output may be absent.

Assignation output K2

```
 ACCUPRESSURE PROBE
Work on P-Probe   xx
SET K2 OUTPUT MODE ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed folowing screen is shown

```
 ACCUPRESSURE PROBE
Work on P-Probe   xx
Enter K2 MODE 0-3  ?
MM/DD/YY WD HH:MM:SS
```

Using keys it is possible to modify assignation of K2

Assignation output OPTO

```
 ACCUPRESSURE PROBE
Work on P-Probe   xx
SET OPTO OUT. MODE ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed folowing screen is shown

```
 ACCUPRESSURE PROBE
Work on P-Probe   xx
Ent. OPTO MODE 0-3 ?
MM/DD/YY WD HH:MM:SS
```

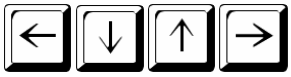
Using keys it is possible to modify assignation of OPTO

Adjustment of OFFSET

```
  ACCUPRESSURE PROBE
Work on P-Probe    xx
Adj OFFSET Value    ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed folowing screen is shown

```
  ACCUPRESSURE PROBE
Work on P-Probe    xx
Ent.OFFSET Val  ?????
MM/DD/YY WD HH:MM:SS
```

Using keys  it is possible to modify OFFSET value.

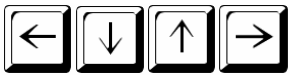
OFFSET value is used to set lowest value (Vacuum value in step)
This is also lower reading of ACCUPRESSURE probe.
OFFSET value determined value Zero for output analog 4-20 mA
Entering 0 means there is no negative value; Entering 80 means probe may show negative value of -1 inches of water column.

Adjust inches (water column) value per step

```
  ACCUPRESSURE PROBE
Work on P-Probe    xx
Inche / Step        ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed following screen is shown

```
  ACCUPRESSURE PROBE
Work on P-Probe    xx
Ent.Inche/Step ?????
MM/DD/YY WD HH:MM:SS
```

Using keys  it is possible to modify

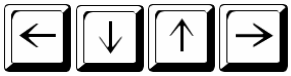
inches/step value of ACCUPRESSURE PROBE. This value is multiply by value of step to obtain measure in inches of water column (Typ. 0.0125)

Adjust millimeter (water column) value per step.

```
  ACCUPRESSURE PROBE
Work on P-Probe    xx
Millimeters / Step ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed following screen is shown

```
 ACCUPRESSURE PROBE
Work on P-Probe   xx
Enter MM/Step  ?????
MM/DD/YY WD HH:MM:SS
```

Using keys  it is possible to modify

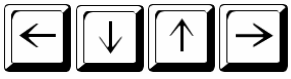
millimeters value per STEP of ACCUPRESSURE PROBE. This value is multiply by number of step to get millimeter value of water column

Adjust 4-20 mA per step

```
 ACCUPRESSURE PROBE
Work on P-Probe   xx
4-20ma / Step      ?
MM/DD/YY WD HH:MM:SS
```

If key is pressed following screen is shown

```
 ACCUPRESSURE PROBE
Work on P-Probe   xx
Ent. 4-20/Step ?????
MM/DD/YY WD HH:MM:SS
```

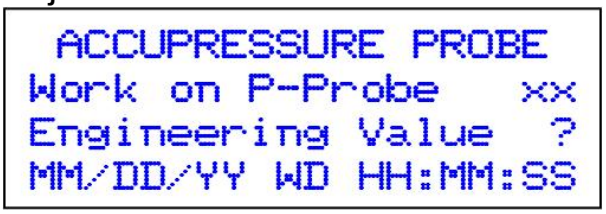
Using keys  it is possible to modify

4-20mA value per step. Value is with 3 decimal to obtain gain of 1 Enter 1000, Max gain 65.535
This value is multiply by STEP value to obtain 4-20ma output
OFFSET is used as reference for 4ma. (Zero)

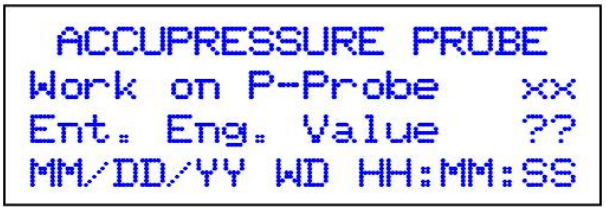
Adjustment of value shows on display of ACCUPRESSURE PROBE.
12 ways are available.

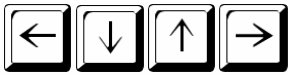
Value	DISPLAY	DESCRIPTION
0	RAW	STEP of 0.0125” water column
1	IWC	Inches Water Column
2	FWC	Feet Water Column
3	CWC	Centimeter Water Column
4	PSI	Pound Square Inches
5	OSI	Once Square Inches
6	IHG	Inches Mercury
7	MHG	Millimeter Mercury
8	KPA	Kilo Pascal
9	KCM	Kilograms square Centimeter
10	MBR	Milli Bar
11	BAR	Bar

Adjustment of ENG value to show on PROBE display



If key is pressed folowing screen is shown

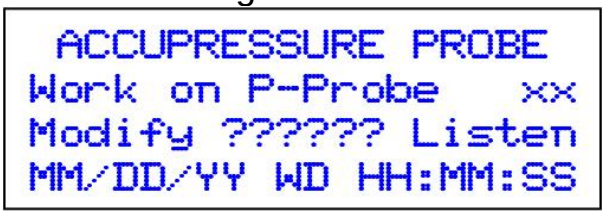


Using keys  it is possible to modify

way PROBE show measured value on display.

MONITORING ACCUPRESSURE PROBE

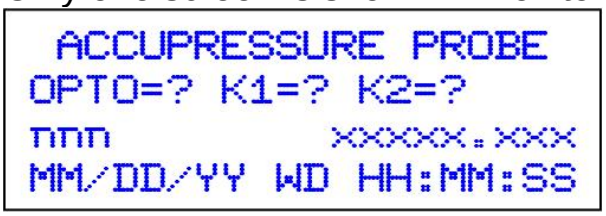
When following screen is shown



(xx) is replaced by number of P-Probe

Pressing or allows Listening value read by probe.

Only one screen is shown in monitoring mode



Output value (?) 1=ON 0=OFF
(nnn) ENG value type
(xxxxx.xxx) Pressure value

Screen is refreshed every 0.5 sec.